

MASTER OF SCIENCE IN SYSTEMS ENGINEERING

LOCALIZATION OF WIRELESS COMMUNICATION EMITTERS USING TIME DIFFERENCE OF ARRIVAL (TDOA) METHODS IN NOISY CHANNELS

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The ability to provide position information of wireless emitters comprises a very important communication tool and has extremely valuable applications to military as well as civilian life. GSM is the most popular method of modulation adopted around the world, for mobile telephony. This thesis is focused on the Time Difference Of Arrival (TDOA) estimation, applied to GSM signals, in noisy channels. Improvements in denoising, in conjunction with wavelet processing, are proposed for estimating the TDOA of signals received at two spatially separated sensors. Wavelet denoising based on a modified maximum likelihood method and a higher order moment method is proposed, to improve the performance. A numerical evaluation of the methods, when unequal SNR conditions prevail, is presented. The performance of the proposed denoising methods in a jamming environment is also addressed. Simple excision schemes to improve the performance when jamming is present, are evaluated. Simulation results indicate good performance of the methods and improved estimates relative to the ones obtained using no denoising. Jamming presence degrades the performance but still the extracted estimates are improved.

DoD KEY TECHNOLOGY AREAS: Electronics, Electronic Warfare

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